

Name: _____

NASA Tropical Rainfall Measuring Mission (TRMM)

TOPIC #1: TRMM: Why Measure Rainfall from Space?

Activity #3: Latent Heat's Disappearing Act

National Science Content Standards A,B,D,E,F, & G

OBJECTIVE: To investigate evidence of latent heat as water changes state .

BACKGROUND: When water is heated, the water molecules absorb the heat energy and begin to vibrate more quickly. Evidence for the absorption of energy can be observed as the temperature of the water increases. However, once the water temperature reaches 100 C or boiling, additional heat provides water molecules with enough vibrating energy to escape their attraction for each other. The water molecules begin to evaporate or change to a gas called water vapor. As they escape to the air the water molecules absorb the added heat as energy of motion. The absorbed heat is temporarily “hidden” in the increased motion of the water vapor molecule. Additional heat that is added to boiling water no longer raises the temperature of the water. Instead the heat escapes with the water vapor molecules. This hidden heat is called latent heat. When the water vapor cools the molecules slow down. As they attract each other they condense to form a liquid. When this change of state happens, the latent heat is released to the air. When clouds and rain condense from water vapor in air, heat is added to the atmosphere. The TRMM satellite is designed to monitor clouds, rain and the release of latent heat. Latent heat affects global weather patterns. This data will help scientists improve computer models that predict changes in the world's weather.

VOCABULARY:

Changes of State - when matter changes phase from a solid, liquid or gas

Latent Heat – heat that is “stored” as the increased motion of water molecules as they evaporate to become water vapor. This hidden heat is released when water vapor condenses back to a liquid.

Molecule – the smallest particle of a compound such as water that still keeps all the properties of the compound

TRMM – NASA satellite that monitors rainfall and latent heat in the tropical regions

HYPOTHEISIS: If heat is added to water after it has reached 100 C or the boiling point, the temperature will _____.

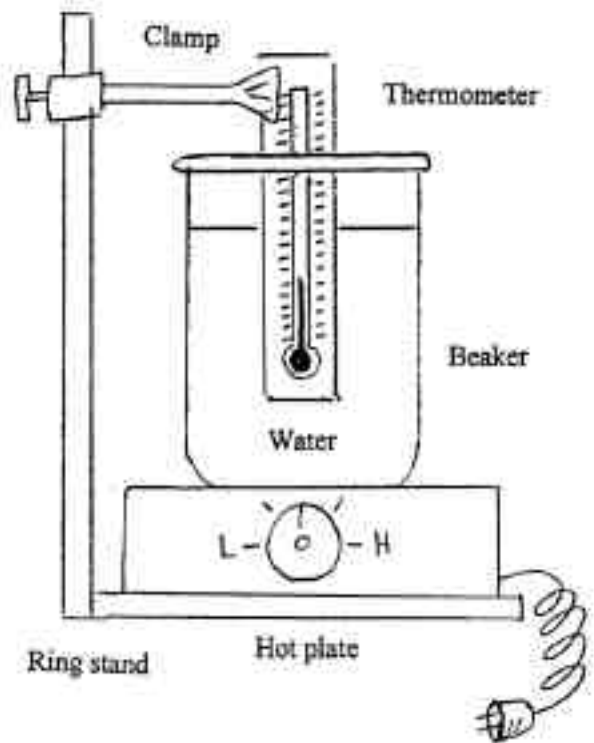
MATERIALS: Hot plate, safety goggles, beaker tongs, 500-mL beaker, Celsius thermometer, a clock with a second hand, water, ring stand, thermometer clamp

PROCEDURE:

1. Complete the hypothesis above.
2. Place 400-mL of water into a 500-mL beaker. Place the beaker on the hot plate.
3. Using the clamp and the ring stand, suspend the thermometer over the beaker of water. Position the bulb under the surface of the water. See Figure #1.

4. Record the starting temperature in the “Data Table”. Put on your safety goggles. Turn the setting on the hot plate to “High”.
5. Record the temperature in the “Data Table” every minute. Put a star next to the temperature that indicates the point at which the water started to boil.
6. Continue to record the temperature for 5 minutes AFTER the water begins to boil.
7. Turn off the hot plate. Using the beaker tongs, carefully pour out the boiling water.
8. Graph the temperatures that were recorded in the data table using a line graph.

DATA TABLE:

[illegible]

ANALYSIS:

1. How many degrees did the water change temperature BEFORE it started to boil? ____
2. What happened to the temperature during the 5 minutes AFTER boiling?_____
3. What happened to the heat which was added after boiling?_____
4. How does latent heat affect weather?